

WHAT IS CLAIMED IS:

1. A stiff, metallic hub for an energy storage device, having a flywheel assembly, wherein the hub produces a critical velocity that exceeds the design operating speed of the flywheel assembly.
2. A stiff, metallic hub as recited in claim 1, comprising:
  - a central core in tight interference fit with a rotary shaft of the flywheel assembly;
  - an outer rim section in tight interference fit with a high-strength, low-density composite fiber rim of the flywheel assembly; and
  - a web section.
3. A stiff, metallic hub as recited in claim 1, wherein the hub is manufactured of material selected from the group comprising aluminum, titanium, and steel.
4. A stiff, metallic hub as recited in claim 2, wherein the web section is continuous.
5. A stiff, metallic hub as recited in claim 1, wherein the critical velocity is between about 1.4 and about 3.0 times the design operating speed of the flywheel assembly.
6. A stiff, metallic hub as recited in claim 2, wherein at high operating speeds, the outer rim section remains flexible enough to deform in a radial direction commensurate with radial deformation of the composite fiber rim of the flywheel assembly to maintain a tight interference fit to substantially minimize vibrations.
7. A stiff, metallic hub as recited in claim 1, wherein the design operating speed of the flywheel assembly is about 22,500 revolutions per minute.

52  
E3

8. A stiff, metallic hub as recited in claim 2, wherein the central core has a critical length to maintain a tight interference fit with the rotary shaft of the flywheel assembly, wherein the critical length is about 1.8 inches at an operating speed of about 22,500 revolutions per minute.

9. A stiff, metallic hub as recited in claim 2, wherein the outer rim section has a critical length to maintain a tight interference fit with the composite fiber rim of the flywheel assembly, wherein the critical length is about 10 inches for an operating speed of about 22,500 revolutions per minute.

10. A stiff, metallic hub as recited in claim 2, wherein the web section has a thickness of about 7/8 inch at an operating speed of about 22,500 revolutions per minute when the rotary shaft is supported by mechanical bearings.

11. A stiff, metallic hub as recited in claim 2, wherein the web section has a thickness of about 2.4 inches at an operating speed of about 22,500 revolutions per minute when the rotary shaft is supported by magnetic bearings.

12. A stiff, metallic hub as recited in claim 2, wherein the outer rim includes at least one balancing rail for balancing the flywheel assembly to substantially minimize vibrations.

13. A stiff, metallic hub as recited in claim 2, wherein the outer rim includes an axial stop to prevent the composite fiber rim from falling off of the outer rim of the hub during high speed operation.